AU J.T. 15(2): 95-100 (Oct. 2011)

Admission Policy and Academic Standard in Engineering Education at the Nigerian Tertiary Education System

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Abstract

Engineering is the bedrock of technological and infrastructural development of any country, and therefore education in engineering should be viewed as an indispensable means of imparting knowledge in engineering for the development of that country. This paper highlights the basic entry requirements for admission into tertiary institutions to read engineering and exposes ills of admitting unqualified candidates through a remedial programme. It also attempts to present factors that lead to the deterioration of the standard in engineering education and finally suggests possible ways to improve the standard by adequate funding of Supervised Industrial Training Scheme in Engineering (SITSIE) programme in order to meet the challenges of the labour market.

Keywords: *Engineering education, SITSIE, training, academic standard, tertiary institutions, technology.*

Introduction

Engineering education, in general terms, could mean a systematic training and instruction given as it relates to science and technology to develop the skill and mental ability of men so that they can make use of resources at their disposal for the benefit or betterment of the society (Nwohu 2002).

Engineering education should be able to provide young engineers with technical ability, imagination and good engineering judgment. It should also provide for them sufficient scientific and mathematical tools with which to analyze engineering problems, and at the same time allow them to make engineering judgments based on empiricism and practical experience (Kuale 1990; Muhammed 1994).

The rapid changes in global environment, new products development and advancement in science and technology underline the imperative of finding new approaches and solutions to the problems of engineering education in Nigeria. The engineering education should aim at bringing knowledge and skills up to date, enhancing existing skills and understanding, revealing new subjects and considerations and finally acquiring new knowledge and skills (Salawu and Susu 1983; Elegha 1990; Salawu 1994).

The subject of education in engineering is broad but, however, the discussion on this subject matter will be limited here to the criteria for entry, the importance and application of engineering technology and the standard of engineering education.

Criteria for Entry

The making of an engineer is a long process beginning from the primary school, but not ending with the university degree. The engineering horizon expands so fast that continuing education, in order to keep abreast of modern developments, is now accepted as part of engineering education (Faluyi 1991). However, the education of would-be engineers should begin at the primary school level when some pictures and models that have engineering feats are shown to them to stimulate their abstract thinking towards engineering.

Subsequently, appropriate counsel should be given to them to guide them on the subjects that will qualify them to read engineering. These subjects are mostly science subjects clearly spelt out in post-primary (secondary) schools. At the secondary school level, the would-be engineers, whose intelligent quotient should be above average, are expected to pass these science subjects including English language at credit level and this result gives them the basis of entry into tertiary institutions to read engineering after taking a qualifying examination, such as an examination conducted by the Joint Admissions and Matriculation Board (JAMB), to these tertiary institutions.

Basically, four (4) credits at a sitting on these science subjects – Mathematics, Physics and Chemistry including English Language are required for entry into tertiary institutions to read engineering.

However, it is observed that some parents would want their children to read engineering even if those children do not pass these science subjects and their intelligent quotient are far below average. In some tertiary institutions where a remedial programme is introduced for geo-political reasons, these parents take the advantage of such programme to 'smuggle in' their children that are not qualified to read engineering, thereby constituting nuisance to the academic staff in engineering and dereliction of the profession. Of course, this will invariably affect the standard of education in engineering as further discussed in section "Standard of Engineering Education".

Importance and Application of Engineering Technology

No meaningful development is achieved in any country without education and no country enjoys at maximum the dividends of technology in the absence of knowledge in engineering acquired through education. Engineering education, therefore, touches nearly every aspect of human endeavour and national prospects. This ranges from industries, transport and energy to potable water among others.

Industries

In the light of the present day realities where industries perform far below their installed capacity due to the prostrate nature of the economy and inadequate trained personnel to operate and maintain the installed machinery for high production and productivity of these industries, it is advisable to view critically the concept of engineering education. If the individuals have the basic education in engineering, it affords them the opportunity of quick understanding of the principles by which the machinery operates and to know its design features for easy maintenance. These individuals may not be manufacturers or producers of the machinery before they know what to do (at the production of manuals) to put it into use and maintain it to enhance the durability and effectiveness of said machinery.

So, industries being the end users of the products of tertiary institutions, especially faculties or schools of engineering, should be interested in what goes into the education and training of engineering students in these institutions. Thus, industries should (Salawu 2000):

- Invest in the faculties/schools of engineering by assisting with the provision of the necessary infrastructure for good teaching, laboratory work and research.
- Provide opportunities for academic staff in engineering to spend some time in industries in order to update their knowledge with the current equipment in use, and keep pace with the rapidly changing technological world.
- Provide training positions for engineering students for their industrial attachments.
- Sponsor young engineering students through their degree programmes.
- Provide well-defined career structure for engineers within their establishments.
- Participate in faculty boards of engineering studies to provide feedback.

Transport

The significance of the transport sector in the Nigerian economy lies in its capacity to move people and goods inside and outside the country. The transport has become an

imperative with regard to the teeming population and compelled successive governments over the years to spend billions of Nigerian Naira on the development of roads, seaports, airports, rail lines as well as water ways and maintenance of same. Due to rapid advancement in technology, which is a function of the quality of education in engineering and science imbibed, the passability of the roads, the navigability of seaports with higher capacity of its fleets and the improvement of the rail lines accompanied by some on-track train protective devices can be attained easily. Moreover, the design, construction and operation of motor vehicles, trains, ships and aircrafts were actualized by the acquired basic engineering education and knowledge in science acquired. Today, however, it is unfortunate that quacks in disguise of being engineers and for political reasons are awarded contracts of constructing some roads and even airports which now have become death traps. This ugly situation ought to have made the Federal Government to prioritize education in engineering and adequately fund it for its standardization.

Energy

It is a fact that for any meaningful development to take place, energy is a basic input. No technological advancement can really take place without guaranteed a steady source of energy. Energy generating technology is concerned, among others, with the conversion of various types of energy (hydro-, oil, nuclear, wind, solar, etc.) to electrical energy. The erratic electric power supply in Nigeria has been the subject of complaints by electricity consumers, often with disruptive and dangerous consequences on the national economy and said consumers. However, this instability in electric power supply is sometimes attributed to the breakdown of its facilities, not unconnected with inadequate maintenance and the prohibitive cost of replacing it in view of the downturn in the economy. But as engineering education is brought into prominence, researches could be done to investigate the causes of power failure and proffer solutions. Moreover, considering the importance of electrical energy in the development of Nigeria, efforts should be made by the Power Holding Company of Nigeria (PHCN), formally called National Electric Power Authority (NEPA) – the utility that generates and delivers electric power to consumers in the country – to augment the electrical energy supply to meet its high demand.

Potable Water (Aduku 1996)

The situation of water infrastructure, especially potable water development and supply does not portend any silver lining either. Perhaps, because of the importance of water as one of the basic necessities of life, successive governments in Nigeria have had to embark on ambitious water development programmes to meet the increasing demand for water, both for domestic, industrial and agricultural uses.

Besides the State Water Agencies, which are in the forefront of water and borehole projects, the Federal Government in collaboration with International Agencies has had to, through the River Basin Development Authorities, marshal a number of engineering related strategies, like the construction of dams, and massive irrigation infrastructures to areas of all year-round cultivation of crops such as wheat, rice, maize and vegetables, which would provide food and raw materials – a foundation for the establishment of agro-based industries.

As commendable as the huge investment in the water infrastructure sub-sector will be, it is ironical that the majority of the urban population today still lacks access to potable water, while to the rural folks it remains but a pleasing illusion to be pursued. Worse still, a good number of the dams meant to provide water both for irrigation farming and livestock use are in a terrible shape thereby making the Nigerian dream for an agricultural revolution a mirage.

Standard of Engineering Education

Many well-meaning Nigerians have expressed grave concern over the deterioration of the standard or quality in so many aspects of their national life ranging from health care services to electric power supply, water supply, telecommunications and other infrastructures.

From the viewpoint of the education in Nigeria at all levels, there is every justification for concern. Most of the universities that introduced remedial options in their programmes create avenue for admitting students with very poor results. It is such a programme that raised the hope of the parents that however poor the results of their children are, they will certainly be admitted into the university. Incidentally, for a university level, about 30% of the total number of students admitted through a remedial programme usually opt for engineering courses (Okpevah 2004). These are the students who at the end of every semester examination would be going from one lecturer to the other in quest of favour for all the courses failed.

Sometimes, unfortunately, some parents encourage their children to obtain degree certificate they do not deserve by enclosing substantial amount of money in an envelope to be given to lecturers that will cooperate with them. Today, one can observe in the labour market the consequences of the low standard that emanated from the annual intake of the dunce in those universities. Such consequences include the sudden collapse of newly erected buildings, badly constructed roads resulting in interspersed pot-holes which have become death traps, etc. Now many supposed graduates cannot defend the worth of their certificates when they are brought to a place to demonstrate their capability. University education is more or less being viewed in consonance with the computer parlance "Garbage-in, Garbage-out".

Table 1. Annual intake of students through a remedial programme.

Year	No. of candidates seeking for admission through a remedial programme	No. of candidates opting for courses in the following schools			
		SEET	SET	SSSE	SAAT
2000	1381	366	355	510	150
2001	1730	520	496	580	134
2002	1790	595	447	578	170
2003	1861	590	520	603	148
2004	2010	593	555	690	172

As an illustration, an increased annual intake of students through a remedial programme is shown in Table 1 according to an interview at the Federal University of Technology (FUT), Minna, Niger State, Nigeria, conducted by Mrs. Aina Okpevah, Education and Curriculum Development Department, University of Jos (UNIJOS), Plateau State, Nigeria (Okpevah 2004).

The following abbreviations are used in Table 1: School of Engineering and Engineering Technology (SEET); School of Environmental Technology (SET); School of Science and Science Education (SSSE); and School of Agriculture and Agricultural Technology (SAAT).

Education Factors Affecting Quality of Engineering

The quality of engineering education is affected by the following:

Dearth of Lecturers

Today, qualified and competent lecturers are difficult to attract to the engineering education industry. Many senior engineers in the education industry have moved to greener pastures elsewhere. Those that are still found in the system are more or less part-time lecturers having sideline jobs they are doing in order to make the two ends meet. What one can find is mostly young engineering graduates (neophytes) standing before classes of one hundred and twenty or more students and reading out their lecture notes. The definitions of the key technical works they do not know. They dodge the mandatory hours of practicals and convert them to theory classes. So, they can only teach what they know or have learnt. These days it is usually a "blind man leading an equally blind counterpart".

Obsolete Equipment, Tools and Instruments

Almost all laboratories and workshops in the Nigerian tertiary institutions are littered with scraps of obsolete equipment, tools and instruments. Actually, finance is needed to maintain and replace obsolete equipment, tools and instruments. This must cover the cost of

project consumables and prototype development with a view to manufacture and produce exhibitable machines / components / pieces (Gasper 1995). However the financial resources from the government for the maintenance and replacement of the obsolete equipment, tools and instruments are depleting. So the training of engineering manpower is done theoretically without the use of equipment, tools or instruments and this consequently brings embarrassment to the graduates when they are expected to apply the theory they were taught to the reality of life. Of course, this affects the quality of engineering education and training in Nigeria.

Attitude of Government

The formulation of policies by the Federal Government for the engineering education should aim at technological growth and enhancing the remuneration of engineering teachers in order to attract them to the engineering education industry. The Federal Government should release enough funds for the purchase of equipment for meaningful teaching, laboratory practices and developmental work which in support for the desired standard. The idea of introducing tuition fees in federal universities should be embraced and implemented by the Federal Government to augment the funding of the engineering education. Bureaucracy that hampers immediate release of funds when approved by the federal government should be restructured in order to enthrone the culture of excellence in the university education. The Federal Government should encourage the implementation of Supervised Industrial Training Scheme in Engineering (SITSIE) as it would serve the nation and the engineering profession well in enhancing the quality of the graduate engineers offered to the employment market.

Conclusion

The advancement of engineering and technology is the key to national development. This accords a special importance to engineering and emphasizes the need for standard engineering education. Therefore, the author of this contribution is of the opinion that entry standards for the training of engineering students should be reviewed to five (5) credits at one sitting on science subjects including English language. The introduction of a remedial programme in universities on the basis of geo-political reasons should be discouraged and phased out. Finally, there should be adequate funding of the universities by the federal government to enhance engineering education and training. The SITSIE programme is a well-conceived complement to the formal grounding in basic theory and experimentation that should receive approval of the federal government for its effective and successful implementation.

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